REFRIGERATION DEVICE WITH CONDENSATION WATER COMPRESSOR

The present invention relates to a refrigeration device with a drip and evaporation container for condensation water according to the preamble of Claim 1. Such a refrigeration device is known from DE 198 55 504 A1. This known refrigeration device has a heat-insulating housing, which encloses a storage compartment for cool goods and in a lower corner has a recess open to the exterior, in which a compressor for a refrigerant circuit of the refrigeration device is arranged. Mounted on the housing of the compressor is a drain pan for condensation water, which condenses in the storage compartment and drains out via an opening formed above the drain pan in the housing into the drain pan.

The drain pan is mounted on the housing of the compressor to utilise heat loss, which the compressor generates during operation, so as to warm the condensation water in the drain pan and thus accelerate its evaporation.

In recent years numerous efforts have been made to minimise energy consumption of refrigerating devices. The consequence of these efforts is that the power consumption, which the compressor needs to cool the storage compartment effectively, is becoming increasingly less with advancing technology. In modern refrigerating devices with high-quality insulation it can therefore eventuate, that exhaust heat from the compressor is no longer sufficient to evaporate the condensation water at the rate at which it flows out of the storage compartment, such that finally the drain pan overflows. If the overflowing condensation water reaches live parts underneath the drain pan, damage can occur to the electrics of the refrigeration device. Condensation water leaving the device can also lead to damage elsewhere, in particular in built-in devices provided for mounting in items of furniture.

It is true that evaporation of the condensation water e.g. by applying electric heating to the drain pan can easily be intensified, yet this would have a negative effect on the energy efficiency of the device.

The object of the invention is therefore to provide a refrigeration device with condensation water evaporator, which guarantees effective, though, with respect to energy consumption of the device, neutral evaporation of the condensation water.

This task is solved by a refrigeration device having the features of Claim 1. The invention is based on the insight that a majority of the heat loss generated in the compressor is not drawn off by thermal conduction inside the compressor, only this is the part of heat loss, whereof a part can be utilised conventionally by mounting the drain pan on the evaporator housing, but by the refrigerant itself. This exhaust heat is conventionally given off by a liquefier to the environment of the refrigeration device. The heat exchanger thermally coupled to the drain pan according to the present invention enables at least a part of this exhaust heat to be drained off to condensation water in the drain pan.

This heat exchanger is effectively incorporated in between a high-pressure output of the compressor and the liquefier, so that the latter can release to the environment only that portion of residual heat, which was not absorbed by the condensation water.

The heat exchanger effectively has a pipe through which refrigerant passes, which is enclosed on at least part of its periphery by the condensation water.

As a result of an embodiment of the invention the pipe is arranged so as to dip into the drain pan, such that it is

enclosed by the condensation water over its entire periphery, insofar as its level in the drain pan is high enough.

As a result of second embodiment the pipe is integrated in a wall of the drain pan.

For costing reasons it is preferable to make the drain pan from plastic. In such a container it is difficult to prevent the growth of bacterial slime, for as long as it contains condensation water, resulting in unpleasant smells being released. According to the present invention this problem can be combated by the heat exchanger being made at least partially from a material, which releases antibacterially effective copper or silver ions. This can be accomplished particularly easily if the pipe enclosed at least partially the condensation water is a copper pipe.

It is also effective if the drain pan is formed partially by a wall of the housing of the compressor and partially by a cap being mounted tight on this housing. For one, the heat transfer from the compressor housing to the condensation water is improved by the omission of a partition, and secondly a refrigerant outlet opening of the housing can be arranged on the part of the wall enclosed by the cap, so that a pipe going out from there runs directly through condensation water collected in the container.

Further characteristics and advantages of the invention will emerge from the following description of embodiments with reference to the attached figures, in which:

Figure 1 is a schematic partial illustration of a refrigerant circuit of a refrigeration device according to the present invention;

Figure 2 shows a compressor with condensation water container mounted thereon according to a second embodiment of the invention; and

Figure 3 shows a compressor with condensation water container according to a third embodiment of the invention.

Figure 1 shows in perspective and in a partially exploded view a part of the refrigerant circuit of a refrigeration device according to the present invention. The housing of the refrigeration device itself is left out for the sake of clarity and is not described in any further detail, since it is known per se. Located on a compressor housing 1 is a suction connection 2, via which unstressed refrigerant enters the compressor, and a pressure connection 3, via which the compacted refrigerant is again discharged.

A condensation water container 4 is provided for mounting on the compressor housing 1 and on its floor has a recess 5, which is adapted positively in the mounted state on the upper part of the compressor housing 1, in order to convey exhaust heat in this region discharged by the compressor as fully as possible into condensation water collected in the container 4.

A pipe 6 is attached to the pressure connection 3. It extends in the form of a loop 7 first via the condensation water container 4, so that any refrigerant fed into there can cool on contact with the condensation water. At least in the region of the loop 7 the pipe 6 is formed by a copper pipe, which emits copper ions to the latter in contact with condensation water in the container 4. These ions have a bactericidal effect, which prevents or at least restricts the growth of bacteria in the container 4.

A subsequent second loop 8 runs on the front side of the (not shown) body of the refrigeration device. Also in this loop 8 the refrigerant gives off heat to prevent free areas of this

front side being cooled so strongly by heat transfer from the storage compartment of the refrigeration device that condensation water accumulates here.

A liquefier 9 is connected to this second loop 8 in the refrigerant circuit. The liquefier 9 is an essentially plate-shaped structure, in which the pipe 6 meanders between a plurality of parallel metal wires 10, welded thereto, which reinforce the liquefier and increase its surface for heat exchange. The liquefier 9 is mounted in a way known per se on a rear side of the refrigerating device housing. Connecting to the liquefier 9 is a dryer, no longer illustrated in the figure, for trapping water impurities in the refrigerant, a throttle, usually in the form of a capillary line, for tensing the refrigerant and an evaporator arranged in close thermal contact with the storage compartment. The refrigerant again reaches the suction connection 2 of the compressor from the output of the evaporator.

Figure 2 shows an alternative embodiment of the arrangement of compressor housing and condensation water container. The condensation water container 4' according to this embodiment is distinguished from that of Figure 1 by the recess 5 being replaced by an opening in the floor of the container 4', in which the upper part 11 of the compressor housing is tightly fitted. Since the insulating effect of the wall of the container is missing, is so a more intensive heat flow from the compressor directly into the water of the condensation water container 4 is possible.

In this embodiment suction connection 2' and pressure connection 3' are connected to the upper part 11 of the compressor housing 1, so that on exiting the pipe 6 runs directly from the compressor housing 1 through the condensation water container 4'. This placing of the connections 2', 3' also means that the section of the pipe running from the evaporator

to the suction connection 2' runs a little far through the condensation water container 4'. To prevent unwanted cooling of the condensation water by the refrigerant refluxing to the compressor, this section can be provided with an insulating collar 12.

Figure 3 shows a third embodiment of the arrangement of compressor housing and condensation water container, which can be expressed as a modification to the embodiment of Figure 2. The condensation water container 4" is shown here cut off. A lower cylindrical section 13 of the condensation water container 4" is adapted to an outside of the compressor housing 1. The sealing can be realised e.g. by large-surface adhesion or by means of a hose clamp laid outside round the section 13, not shown. An upper section 14 of the condensation water container 4" is shown wedge-shaped here and widening upwards, but it could also be cylindrical with the same diameter as section 13. The pipe 6 going out from the pressure connection 3' of the compressor housing 1 forms several spiral loops 7", attached to the inside of section 14. The loops 7" thus take on a support function for the condensation water container 4", so that its wall material can be of lesser strength and stiffness.